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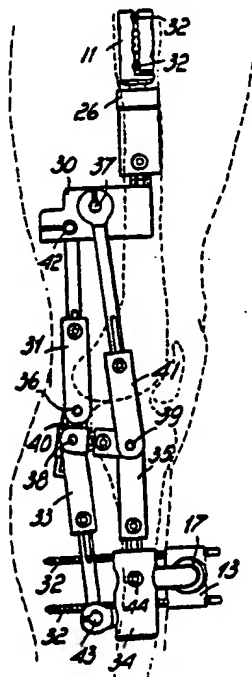
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(54) Title: **ARTICULATION SUPPORT DEVICE**

(57) Abstract

Device for the support of human articulations, comprising a first element (10) which supports a first member (11) adapted to be connected to the first bone of the articulation, and a second element (12) supporting a second member (13) adapted to be connected to the second bone of the articulation. The first element supports a first hinge (14) and a second hinge (15), and the second element supports a third hinge (16) and a fourth hinge (17). The first hinge and the third hinge are connected by a first connecting rod (18), and the second hinge and the fourth hinge are connected by a second connecting rod (19). The device can be applied to damaged articulations, allowing and guiding the natural motion of the articulation until complete healing is achieved.



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ARTICULATION SUPPORT DEVICE

Technical Field

The present invention relates to a device for the support of human articulations, adapted for therapeutic use for damaged articulations and/or bone structures.

Background art

Supporting structures for articulations are known, in particular for the articulation of the knee, which employ one hinge or two coaxial hinges to support the two parts of the leg which articulate at the knee: the femur and the tibia. However, in practice it has been observed that such known structures do not produce useful effects since they are unable to follow the natural movement of the tibia with respect to the femur, and therefore cause, in the knee, during the flexing of the leg, additional stresses which far from facilitating the healing process determine instead further damage.

DISCLOSURE OF THE INVENTION

The aim of the present invention is to provide a device for the support of human articulations which allows to follow the natural movement of the articulation without producing extraneous stresses.

An object of the invention is to provide a device having modest weight and dimensions which can be applied to the articulation and transported easily.

Another object of the invention is to provide an adjustable device, which can be adapted to the particular configuration of the articulation of each single individual.

An important object of the invention is to allow the reconstruction of the cartilage tissues of the articulation.

This aim, as well as these and other objects, are achieved by the device for the support of human articulations according to the invention, which comprises a first element which supports a first member adapted to be connected to the first bone of the articulation, a second element supporting a second member adapted to be connected to the second bone of said articulation and is characterized
10 in that said first element supports a first hinge and a second hinge, and in that said second element supports a third hinge and a fourth hinge, said first hinge and said third hinge being connected by a first connecting rod, said second hinge and said fourth hinge being connected by a
15 second connecting rod, the axes of rotation of said first, second, third and fourth hinges being parallel to one another.

BRIEF DESCRIPTION OF THE DRAWINGS

Further characteristics and advantages of the invention will become apparent from the description of a preferred,
20 but not exclusive, embodiment of the device, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

figure 1 is a lateral view of the device according to the invention;

25 figure 2 is a lateral view, in partial cross section, of an enlarged detail of the device of figure 1;

figure 3 is a lateral view of a second embodiment of the device according to the invention; and

figure 4 is a lateral view, in partial cross section, of the device of figure 3.

WAYS OF CARRYING OUT THE INVENTION

5 With reference to figure 1, the device according to the invention is illustrated in its application to the articulation of a human knee. The device comprises a first element 10, which supports a first member 11. The first member 11 is adapted to be connected to the first bone of
10 the articulation, to the femur in the particular case illustrated. The connection between the first member 1 and the femur is obtained by means of screws. A second element 12 supports a second member 13. The second member 13 is adapted to be connected to the second bone of the
15 articulation, to the tibia in the particular case illustrated. The connection between the second member 13 and the tibia is achieved by means of screws. The first element 10 supports a first hinge 14 and a second hinge 15. The second element 12 supports a third hinge 16 and a fourth
20 hinge 17. The first hinge 14 and the third hinge 16 are connected by a first connecting rod 18. The second hinge 15 and the fourth hinge 17 are connected by a second connecting rod 19. The axes of rotation of the first, second, third and fourth hinges are parallel to one another and are
25 substantially perpendicular to the plane of motion, that is to say to the plane which contains the femur and the tibia

in all the positions of their relative motion.

According to a preferred embodiment of the device according to the invention, the positions of the first hinge 14 and of the second hinge 15 on the first element 10 are each adjustable with two degrees of freedom of adjustment, in a plane perpendicular to the axes of rotation. Similarly, the positions of the third hinge 16 and of the fourth hinge 17 on the second element 12 are each adjustable with two degrees of freedom of adjustment in a plane perpendicular to said axes of rotation.

With reference to figure 2, a hinge 20, which represents any of the hinges 14, 15, 16 and 17, is supported in the first element 10 or in the second element 11 by means of first adjustment means constituted, for example, by the pair of screws 21 and 22, which allow the setting of the first degree of freedom of adjustment. Said hinge 20 is furthermore supported by means of second adjustment means, constituted, for example, by the pair of screws 23 and 24, which allow the setting of the second degree of freedom of adjustment.

With reference to figure 1, the length of the second connecting rod 19 is adjustable, for example by means of a telescopic body 25 which can be locked in any desired position by means of a locking screw. The first element 10 is connected to the first member 11 by means of, for example, a spherical hinge 26, which can be released or

locked in any position during the step of application of the device to the articulation. The second element 12 is connected to the second member 13 by means of a spherical hinge 27, which can be locked or released in any position during the application of the device to the articulation. The spherical hinges 26 and 27 allow to adapt the device to the particular and, to a certain extent, casual positioning of the screws in the femur and in the tibia.

With reference to figures 3 and 4, an embodiment of the invention, particularly preferred from the point of view of the mechanical assembly of the various parts, is illustrated; the device according to the invention comprises a first element 30, 37, which supports a first member 11. The first member 11 is adapted to be connected to the first bone of the articulation, to the femur in the particular case illustrated. The connection between the first member 11 and the femur is achieved by means of screws 32. A second element 33, 34, 35 supports a second member 13. The second member 13 is adapted to be connected to the second bone of the articulation, to the tibia in the particular case illustrated. The connection between the second member 13 and the tibia is achieved by means of screws 32. The first element 30, 31 supports a first hinge 36 and a second hinge 37. The second element 33, 34, 35 supports a third hinge 38 and a fourth hinge 39. The first hinge 36 and the third hinge 38 are connected by a first connecting rod 40. The

second hinge 37 and the fourth hinge 39 are connected by a second connecting rod 41. The axes of rotation of the first, second, third and fourth hinges are parallel to one another and are substantially perpendicular to the plane of motion, that is to say to the plane which contains the femur and the tibia in all the positions of their relative motion.

The first element 30, 31 is formed by a supporting body 30 which supports the first member 11, and by a telescopic arm 31 which is connected to the supporting body 30 by means of a hinge 42 which can be locked and released.

The second element 33, 34, 35 is formed by a supporting body 34 which supports the second member 13 and a telescopic arm 33 which is connected to the supporting body 34 by means of a hinge 43 which can be locked and released.

Naturally the release and locking of the hinges 42 and 43 occurs only during the step of adjustment of the device according to the invention, while during the subsequent operation the hinges 42 and 43 are always locked.

Similarly, after the initial adjustment, the adjustable connecting rods 40 and 41 always operate only with their preset length, which must no longer be modified during operation.

The same is true for the arms 31, 33, 35, which are kept at their preset length after the initial adjustment.

The arm 31 supports the first hinge 36, the arm 33 supports the third hinge 38 and the arm 35 supports the

fourth hinge 39.

The supporting body 34 can be moved during the initial preadjustment with respect to the member 13 and can thus be fixed by acting on the nut 44.

5 The present invention is susceptible to numerous modifications and variations, all of which are within the scope of the same inventive concept; in particular the means for the adjustment of the position of the hinges can be provided with a great number of solutions which are 10 mechanically different but perfectly equivalent with regard to the present invention.

CLAIMS

1 1. Device for the support of human articulations,
2 comprising a first element which supports a first member
3 adapted to be connected to the first bone of the
4 articulation, a second element supporting a second member
5 adapted to be connected to the second bone of said
6 articulation and characterized in that said first element
7 supports a first hinge and a second hinge, and in that said
8 second element supports a third hinge and a fourth hinge,
9 said first hinge and said third hinge being connected by a
10 first connecting rod, said second hinge and said fourth
11 hinge being connected by a second connecting rod.

1 2. Device according to claim 1, characterized in that
2 the axes of rotation of said first, second, third and fourth
3 hinges are parallel to one another.

1 3. Device according to claim 1, characterized in that
2 the positions of said first hinge and of said second hinge
3 on said first element are each adjustable with two degrees
4 of freedom in a plane perpendicular to said axes of
5 rotation.

1 4. Device according to claim 1, characterized in that
2 the positions of said third hinge and of said fourth hinge
3 on said second element are each adjustable with two degrees
4 of freedom in a plane perpendicular to said axes of
5 rotation.

1 5. Device according to claim 1, characterized in that
2 the length of said second connecting rod is adjustable.

1 6. Device according to claim 1, characterized in that
2 said first element is connected to said first member by
3 means of a spherical hinge which can be locked or released
4 in any position.

1 7. Device according to claim 1, characterized in that
2 said second element is connected to said second member by
3 means of a spherical hinge which can be locked or released
4 in any position.

1 8. Device according to claim 1, characterized in that
2 said first element is formed by a supporting body which
3 supports said first member, and by a telescopic arm
4 connected to said supporting body by means of a lockable and
5 unlockable hinge.

1 9. Device according to claim 1, characterized in that
2 said second element is formed by a supporting body which
3 supports said second member, and by a telescopic arm
4 connected to said supporting body by means of a lockable and
5 unlockable hinge."

1 10. Device for the support of articulations, according
2 to what is described and illustrated.

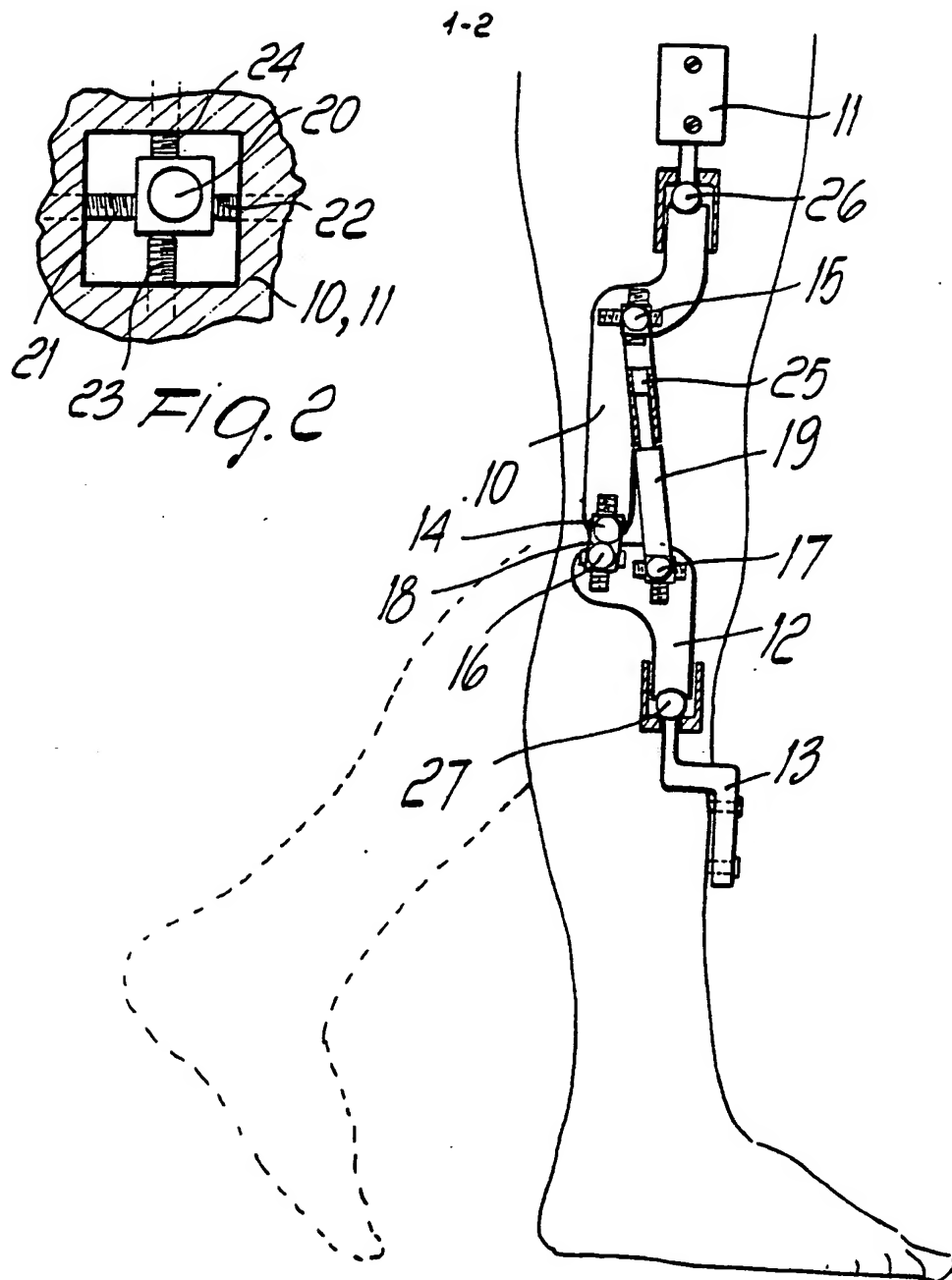
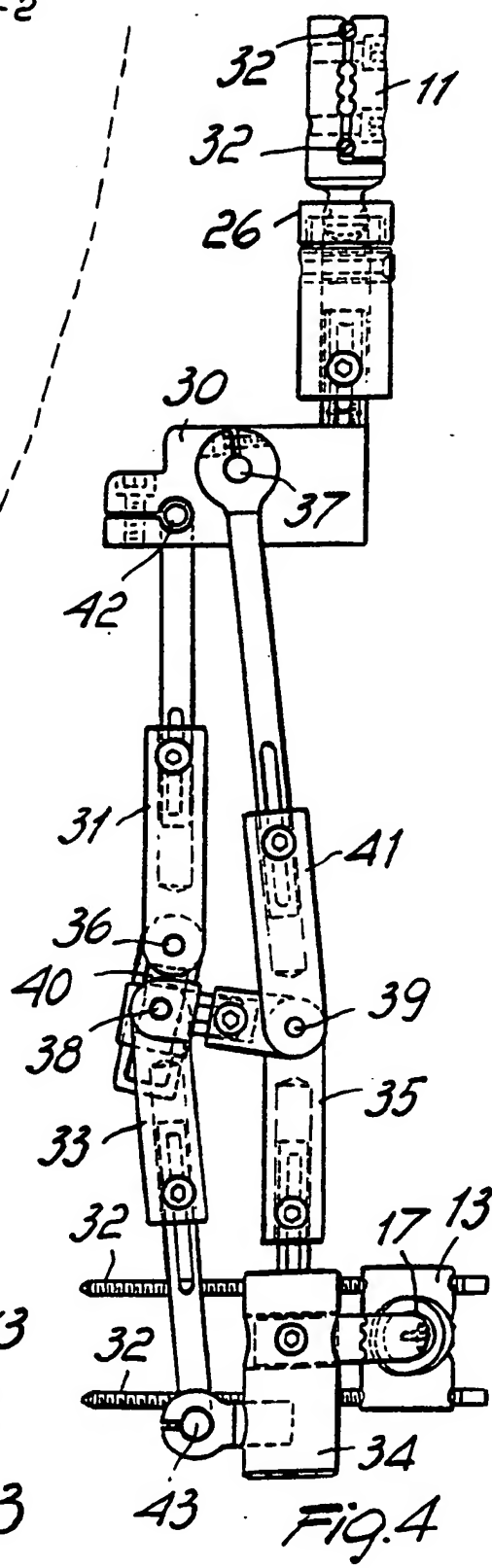
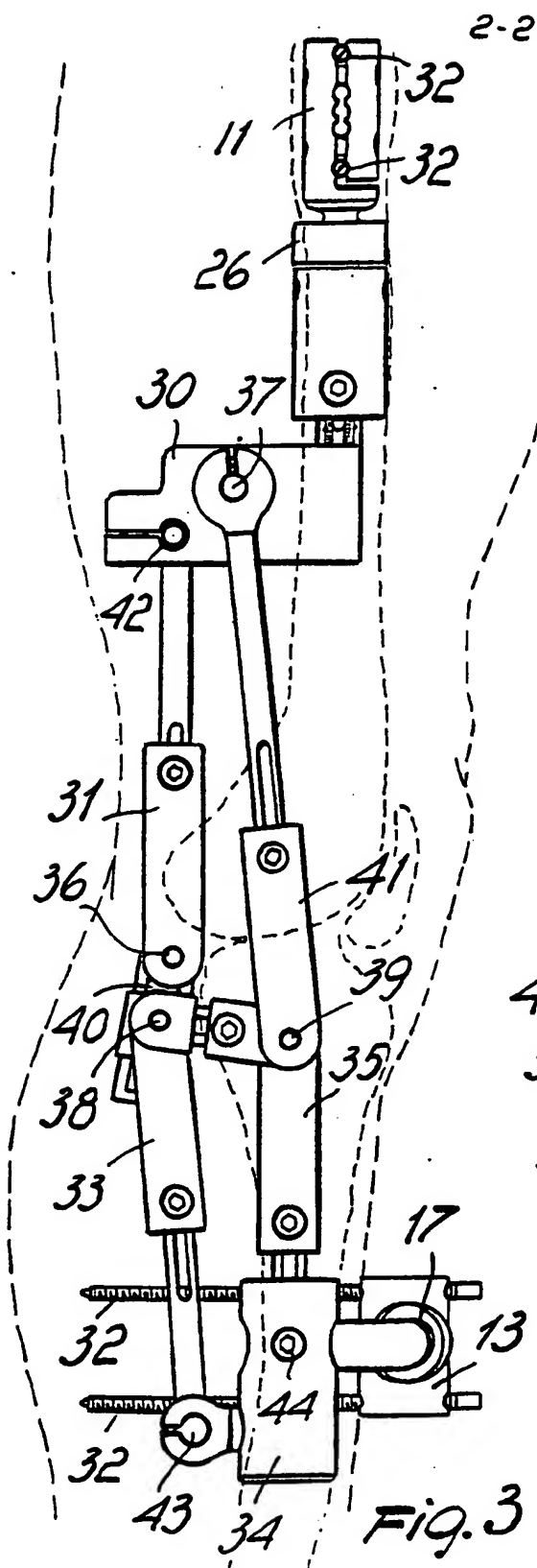


Fig. 1



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